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Finding the Appropriate Forage Value for Analyzing the Feasibility of Public Range Improvements

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Fred J. Wagstaff
C. Arden Pope III

RESEARCH SUMMARY
To complete economic analysis of range improvements completed on the Oak Creek Management area of central Utah, we needed an estimate of the value of forage. A review of the literature revealed several methods of estimating forage values. These methods yielded eight estimates of public rangeland forage ranging from $1.23 to $30 per animal unit month (AUM). Six of the estimates were based on actual market transactions, or current administered prices and were the most reflective of actual economic processes. The best estimates of value were those for leasing similar rangeland in the immediate area.

THE AUTHORS
FRED J. WAGSTAFF is a range economist with the Intermountain Research Station, Shrub Sciences Laboratory, Forest Service, U.S. Department of Agriculture, Provo, UT. He received his Ph.D. degree in range and wildlife science at Brigham Young University in 1983. He has served in the Forest Service in various planning and administrative capacities for approximately 20 years. He has conducted research primarily relating to range and resource economics.

C. ARDEN POPE III is an associate professor of agricultural and resource economics at Brigham Young University, Provo, UT. He received his Ph.D. degree in agricultural economics from Iowa State University in 1981. Previously, he worked as a research associate and staff economist for the Center for Agricultural and Rural Development, and as an assistant professor of agricultural economics at Texas A. & M. University. He has conducted and published research findings dealing with a broad range of issues and topics relating to production and natural resource economics.

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Intermountain Research Station
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Ogden, UT 84401
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INTRODUCTION
The concern about finding the value of range forage on public lands has been with us for many years. The Federal Government has long been concerned with determination of grazing fees based on fair market values (Sutton 1988; Andrus and Berglund 1977). The search for the most appropriate value for public land grazing has led to many studies throughout the years using different approaches and resulting in a multitude of recommendations (Clawson 1968; 1972; Roberts 1963, 1967; Nielsen 1972; Bartlett 1988). The results of these evaluation studies have been tempered by the political process involved in grazing fee determination and have resulted in an administrative fee based largely on political compromises that generally underestimate the value of public land grazing benefits.

Using an appropriate level of grazing value or benefit is crucial in economic analysis because use of unsupported and unrealistic values casts doubt on the validity of the conclusions. Currently, there is considerable variation in the values used for planning and analysis purposes even within a single agency (USDA 1982). Brown (1984) points out there are numerous assumptions in many methods of determining values, and “the value” probably does not exist. Viewing forage from a static value concept differs from a standard economic theory because value prices are continuously fluctuating around a dynamic equilibrium due to supply and demand forces (Watson and Holman 1977).

Economic analysis of range improvement practices and comparison of alternative uses for rangeland require reasonable and appropriate estimates of the value of livestock grazing benefits. These estimates, however, differ greatly depending upon the assumptions used and the critical assumptions. This paper will briefly discuss the most common approaches to valuing livestock grazing on public lands. The variability in results is highly questionable due to the critical assumptions.

Evaluation Methods
Currently, the forage value that is used to establish the grazing fees charged by the Bureau of Land Management (BLM) and Forest Service is based on a predetermined formula. This formula consists of a base value of $1.25 per animal month (AUM) and is adjusted annually based upon charges in private grazing leases, value of beef cattle, and the cost of production. The base value of $1.25 is based on leases of forage from 1964 to 1968. In 1985, grazing fees were set at $1.35, and based on this formula, grazing fees in 1986 would be about $1.39. A recent executive order by President Reagan maintains the current fee but sets a floor of $1.35 per AUM. The grazing fee has not been set at a level reflecting full market value in the past, nor does it appear this will happen in the near future. The practice of underpricing has caused the grazing permits to take on value through capitalization of the surplus.

Budgeting Procedures
Several methods of ranch firm or enterprise budgeting can be used to estimate the value of forage. These methods range from farm-documented estimates of firm expenses and income to highly complex computerized linear programming models. Recent publications by the Economic Research Service show the results of applying linear programming in Western States (Gee 1981, 1985). Values obtained from linear programming studies where producer estimates of values are grouped are consistently, and often considerably, higher than the results of other methods. This probably reflects the results of using small samples of producers and the fact that other methods underestimate the full value of forage in the production process.

The budgeting approach to estimating value has appeal because of the straightforward procedure, but it rests on several assumptions that need to be understood. The budget approach depends upon the correct allocation of income and expenses to numerous variables utilized in a livestock firm, and without large amounts of expense and accounting data it is questionable (Bartlett 1983). During times of rapid price fluctuations it can be expected that budgeting may be seriously deficient as an estimator of value.

Major criticism and questioning of the value has come from producers and authors. They basically assert that forage is highly questionable to allocate residual income to a single factor such as grazing value (Gee 1984). Indeed, to arbitrarily price management and unpaid family labor at some prescribed level and then allocate remaining value to another factor seems highly questionable.

In practice, budgeting can be used to give some rough first approximations - i.e. values and as a check on other methods. Because budgets require considerable data, many analysts rely on secondary sources for many items and supplement this with primary data. This tends to decrease accuracy of results.

Substitute Feed Method
Economic theory holds that if two factors are perfect substitutes for each other in a production process and the value of one is known, the value of the other in the process is set at the same level (Watson and Holman 1977). There have been attempts to value range forage by this approach (Roberts 1967; Bartlett 1988). In these studies, relatively high values were derived due to the strict assumptions of the model. The substitute feed approach rests upon determining a price for the substitute, which is commonly hay because market prices are recorded. This price then must be adjusted for quality differences, location, and other costs incurred in using the substitute, and considerable judgment is required as well as some assumptions concerning the probability and feasibility of such a practice (Wagstaff 1983).

Market Comparisons
Several studies conclude that there is an established market for public range forage and that the value of forage can be determined through market analysis (Gardner 1962; Bartlett and others 1981; Bartlett 1985). Estimates of value are made by comparing the item in question to the value of a similar item for which market prices have been exchanged. The larger the number of market transactions and the more homogeneous the item, the more reliable the estimate will be. Range forage is location specific; livestock must be moved to where the forage is. Also, certain ranges have climatic attributes that allow use only during a specific season.

If a range forage market does exist and public land forage is traded as described by Nielsen and Wenzelgren (1970), Bartlett (1983), Gardner (1962), and Roberts (1967), then exchange price could be used to estimate value. It is true that adjustments must be made and care exercised to compare transactions that are as similar as possible to the subject market.

The literature details two approaches to market comparisons. One approach uses sales of forage itself through rentals or leases with required adjustments. The other approach uses the capitalized value of Federal grazing permit transfers between individuals.

Estimate 1 is the grazing fee for 1985 established by the current equation for supply and demand. Because the trend upon which this fee is determined have not proven highly reliable, and political considerations have held the fee at levels different from those shown by the indexing, the fee as an estimate of full value for livestock production. This estimate is a value in an average value and would be low as an estimate of additional forage value. Estimate 2 comes from budget/linear programming. The figure is from an Economic Research Service (ERS) study using linear programming to estimate grazing value (Gee 1984). The AUM value of $9.46 is basically the estimated residual income to the forage as determined by this approach. This estimated value reflects the higher value of because a panel of producers generated the coefficient for the budgets, and they probably reflect a higher than average efficiency in livestock production.

Estimate 3 are based on the substitute feed approach. This approach is highly questionable and results
CONCLUSION

Evidently, estimates of forage value differ significantly depending upon the methodology and assumptions used. How sensitive is such an estimate to be determined through market comparisons of the most likely substitute forage. Such an estimate is based on what producers should pay, not what they hypothetically could or should pay.

This study suggests that a reasonable estimate of the market value of public range forage in the Oak Creek area falls within the $4.50 to $6.50 range. Economics analysis of range improvements should consider the sensitivity of the analysis results to charges in forage values.

The feasibility analysis of public range improvements will be most accurate if forage values derived from market transactions are used or they are most reflective of actual conditions. Roome estimates from other methods could be used for a quick estimate, and then a sensitivity analysis can be used to show how much effect is justified in getting a more accurate value of the fee and the linear programming studies could be used with high and low values for first estimates of forage value.

In the case of a forage value, with the exception of the value of hay as a substitute feed, economics analysis of range improvements can be obtained in this range. The project costs per additional AUM of forage produced were quite high (see Pope and Westfall 1987).

REFERENCES


constructs that the price paid for permits on an AUM basis ranged from $29.70 to $65.61 with an average of $57.29. The average price paid for permits on an AUM basis for Federal lands for 1978 through 1985 are given in table 2. These compare closely with 1980 public permit values as used in the 1983 Grazing Fee Review and Evaluation (USDA and USDI 1985). The value was annualized assuming a perpetual interest in the average, using a 5 percent interest rate and added to the annual grazing fee.

To obtain estimates, prices for grazing on State of Utah Division of Water Resources land were obtained. State lands, similar to those in the project area that are included in an open bidding process, are used to calculate average bid price for each year. A large tract of land managed by the State of Utah lies adjacent to the southeast of the development area. It is similar in topography and vegetation, is used during the same season, and

<table>
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<th>Year</th>
<th>Average</th>
<th>Change from previous year</th>
<th>Dollars</th>
<th>Percent</th>
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<td>0.48</td>
<td>-0.5</td>
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<td>1980</td>
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<td>0.97</td>
<td>-0.5</td>
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<td>-0.5</td>
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<td>0.71</td>
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</tr>
<tr>
<td>1985</td>
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</tr>
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</table>

Average, 1983 to 1985: 0.23
Eight methods for estimating the value of an animal unit month of public rangeland grazing generated estimates applicable to the Oak Creek area of central Utah. Of the eight estimates, six bracketed the range of acceptable estimates. The price paid for leasing similar rangeland was considered the most accurate estimate.

**KEYWORDS:** forage value, AUM value, public grazing value